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EXTENSION THROUGH ANALOGY A USEFUL METHOD IN THE STUDY OF DISPARITIES

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The method of extension through analogy is, in our view, useful for comparisons between miscellaneous economical indicators belonging to the same structure, also between indicators which belongs to various economical areas like cities, regions, countries. Taking into account Romania's admission to the European Union, this method would establish the extant temporary disparities and would impress those responsible in the political economy. As a novelty we present it in the context of square trends.

***Keywords**: disparities, extension*

1. Theoretical foundations

From several reasons, some indicators develop convergent or divergently, also the economical regions depict different levels of development. For boastfulness reasons, in the past, comparisons were made by the socialist leaders of the period when the countries which passed through the development process would have reached and outran the developed countries, comparison which did not have, as history proved a real support.

The method of extension through analogy offers a scientifically support for this kind of comparisons, under the condition of indicators compatibility and statistical information. It was stated by Francois Hetman and put into practice for linear trends in Virgil Iordache's work in a study regarding people's consumption.

The method requires the following stages:

a) Analyzing information compatibility and processing them if necessary.
b) Trends determination for the indicators that are to be compared.
c) Establishing the convergence or divergence trend.
d) Identification of the temporal disparity amplitude.

Assuming that the indicators which are to be compared record the following parabolic trends:

$$y_1 = a_1 t_1^2 + b_1 t_1 + c_1$$
$$y_2 = a_2 t_2^2 + b_2 t_2 + c_2$$

in which:

y = indicator; t = time;
a, b, c = coefficients
t2 = t_1+d so as:

$$a_1 t_1^2 + b_1 t_1 + c_1 = a_2 (t_1 + d)^2 + b_2 (t_1 + d) + c_2$$

with the solution depending on d variable, which depicts the temporal disparity:

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$$d = -\frac{1}{2}\frac{b_2 + 2_2 t_1 - \sqrt{b_2^2 + 4a_2a_1t_1^2 + 4a_2b_1t_1 + 4a_2c_1 - 4a_2c_2}}{a_2},$$
$$= -\frac{1}{2}\frac{b_2 + 2_2 t_1 + \sqrt{b_2^2 + 4a_2a_1t_1^2 + 4a_2b_1t_1 + 4a_2c_1 - 4a_2c_2}}{a_2}$$

There will be a level of t1 for which the temporal disparity will be null and will be set up as:

$$t_1 = -\frac{1}{2}\frac{b_2 - b_1 + \sqrt{b_2^2 - 2b_2b_1 + b_1^2 - 4a_1c_1 + 4a_1c_2 + 4a_2c_1 - 4c_2a_2}}{-a_1 + a_2},$$
$$= -\frac{1}{2}\frac{b_2 - b_1 - \sqrt{b_2^2 - 2b_2b_1 + b_1^2 - 4a_1c_1 + 4a_1c_2 + 4a_2c_1 - 4c_2a_2}}{-a_1 + a_2}$$

In this condition the temporal disparity will be positive or negative if:

$$\begin{cases} d & t_1 < -\frac{1}{2}\frac{b_2 - b_1 - \sqrt{b_2^2 - 2b_2b_1 + b_1^2 - 4a_1c_1 + 4a_1c_2 + 4a_2c_1 - 4c_2a_2}}{-a_1 + a_2} \\ d = 0 & t_1 = -\frac{1}{2}\frac{b_2 - b_1 - \sqrt{b_2^2 - 2b_2b_1 + b_1^2 - 4a_1c_1 + 4a_1c_2 + 4a_2c_1 - 4c_2a_2}}{-a_1 + a_2} \\ -d & -\frac{1}{2}\frac{b_2 - b_1 - \sqrt{b_2^2 - 2b_2b_1 + b_1^2 - 4a_1c_1 + 4a_1c_2 + 4a_2c_1 - 4c_2a_2}}{-a_1 + a_2} < t_1 \end{cases}$$

It can be therefore estimated whether the indicators have either convergent or divergent trends and also which will be the trend regarding t1 future dimension.

2. Numerical application

For using the method we suggest studying of the evolution of the Romanian export by forms of propriety during 1991-2004, based on data in table 1:

Evolution of Romania's export by forms of propriety

in millions of US dollars FOB term

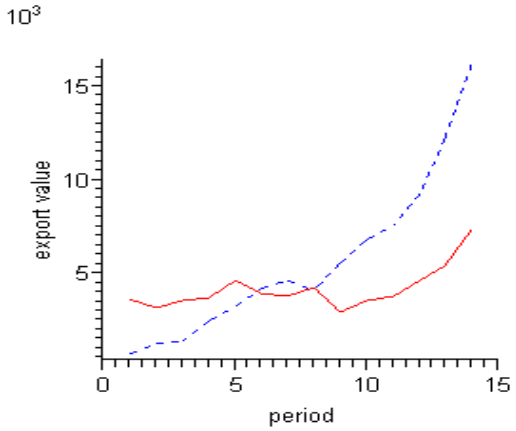
FOB term

Indicator	1991 t=1	1992 t=2	1993 t=3	1994 t=4	1995 t=5	1996 t=6	1997 t=7	1998 t=8	1999 t=9	2000 t=10	2001 t=11	2002 t=12	2003 t=13	2004 t=14
stat	3587	3162	3528	3670	4651	3928	3810	4241	2914	3553	3794	4634	5429	7340
privat	679	1201	1364	2481	3259	4156	4621	4061	5573	6814	7591	9242	12189	16145

Source: National Commission of Statistics

The diagram of Romanian export evolution is depicted in picture 1 and justifies the utilization of parabolic shape of adjustment regarding trends determination.

Fig.1 The evolution of Romanian export by forms of property during 1991-2004
Continuous line-gouvernment property Punctuated line-private property

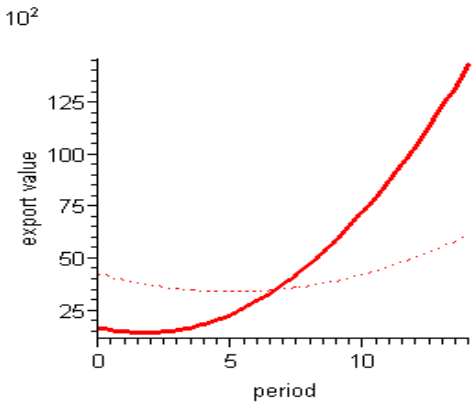


The trends of government and private exportation obtained on the basis of the smallest squares are in the following form:

$$y_1 = 34{,}521\, t^2 - 349{,}79\, t + 4280{,}8$$

$$y_2 = 86{,}254\, t^2 - 304{,}66\, t + 1701{,}2$$

Fig 2 Evolution of adjusted exportation
Fine line-guvernamental Thick line private



It is noticed that if in the initial period the governmental exportation was bigger than the private one, at the end the hierarchy inverts and, in the future this disparity will enlarge in favor of private export, the natural tendency regards the present Romanian economy stage.

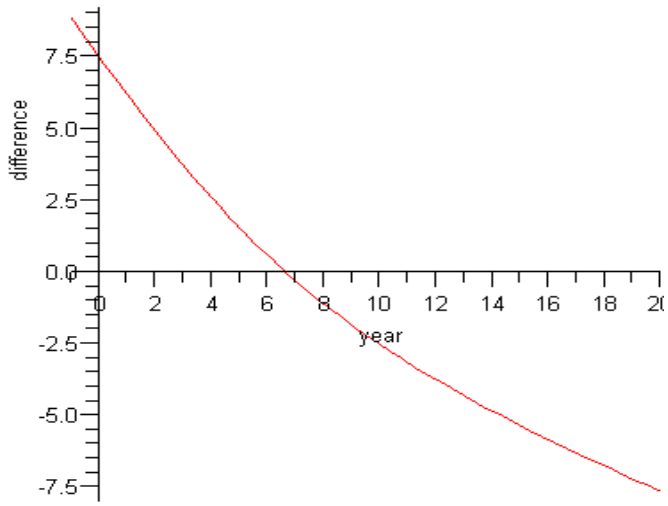
The temporary between governmental export and the private one has the following form:

$$d = -1 \cdot t_1 + 1{,}766063023$$
$$+ 0{,}00001159366522\sqrt{2{,}977574334 \cdot 10^9 \cdot t_1^2 - 3{,}017078666 \cdot 10^{10} \cdot t_1 + 2{,}457052473 \cdot 10^{11}},$$
$$-1 \cdot t_1 + 1{,}766063023$$
$$- 0{,}00001159366522\sqrt{2{,}977574334 \cdot 10^9 \cdot t_1^2 - 3{,}017078666 \cdot 10^{10} \cdot t_1 + 2{,}457052473 \cdot 10^{11}}$$

and which is null, in other words when both private and government propriety had registered equal exportation, was recorded in t1 moment: t1:= 6.638701670, correspondent with middle 1996.

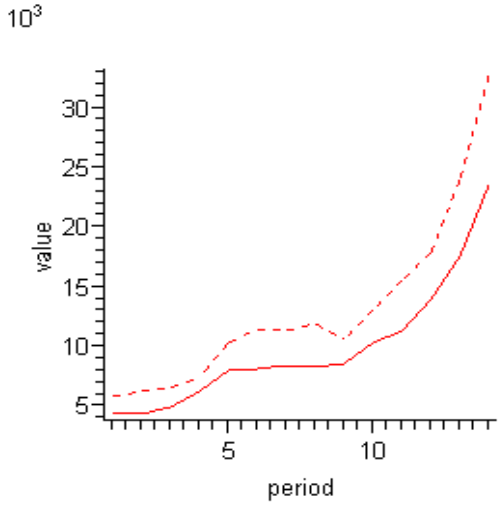
The relation between temporal difference and time is depicted in No. 3 fig. and conveys the fact that if initially government export was prevalent, after 1996 private export became in majority and, in the future, it will grow and the difference will continually grow.

Fig 3 The evolution of difference between government and private commerce expressed in years 1991=1



There are situations when temporal disparity may not record sizes with both signs as was the case of Romanian export and import trends during 1991-2004 outlining a constantly balance due, with amplification tendency .

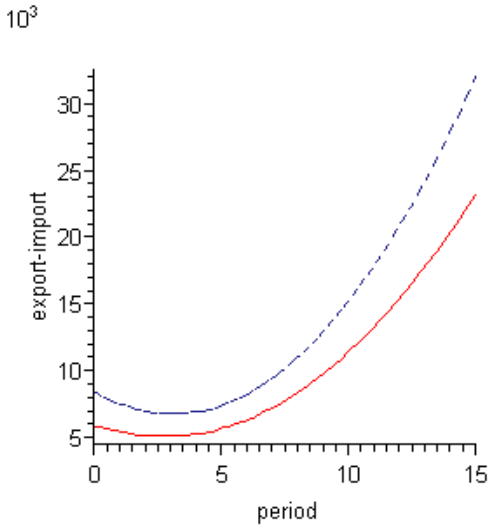
Fig 4 Evolution of Romanian exports and imports between 1991-2004 in milions US dollars 1991=1 FOB terms-export CIF terms-import Continous line-export Punctated line-import



The parabolic adjustment of exportation and importation trends are in analytical shape and graphics as depicted in No.5.fig.

$$y_1 = 120{,}78\, t^2 - 654{,}46\, t + 5982{,}0$$
$$y_2 = 178{,}08\, t^2 - 1098{,}2\, t + 8507{,}3$$

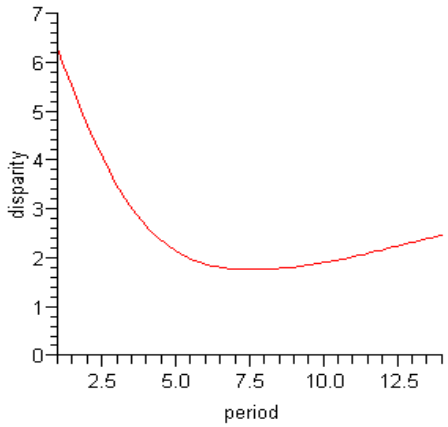
Fig 5 Evolution of Romanian exports and imports between 1991-2004 adjustment



It is noticed that in the next period the balance due will grow, due to the maintaining of the same trend and if there will be no economical policies to limit this lack of poise.

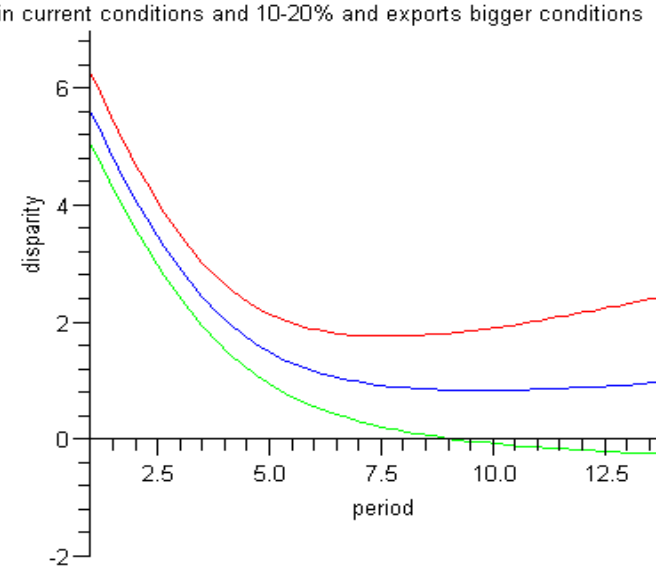
$$d = -1 \cdot t_2 + 2{,}709306177$$
$$+ 0{,}00008279516476\sqrt{2{,}15085024 \cdot 10^8 \cdot t_2^2 - 1{,}236405960 \cdot 10^9 \cdot t_2 + 4{,}120852069 \cdot 10^9},$$
$$-1 \cdot t_2 + 2{,}709306177$$
$$- 0{,}00008279516476\sqrt{2{,}15085024 \cdot 10^8 \cdot t_2^2 - 1{,}236405960 \cdot 10^9 \cdot t_2 + 4{,}120852069 \cdot 10^9}$$

Fig 6 The evolution of disparity between imports and exports



It would be also useful a simulation of the disparity between imports and exports under the conditions of presumption of modification with a certain percent of these indicators on the whole period. Presuming that imports would remain the same and the exports would increase with 10-20%, the evolution of the disparity would become as in No.7.fig.. Therefore, if the exports had been 20% bigger than the effective imports, the disparity would have diminished meaningfully and by 1991 the commercial balance would have been zero and recording a surplus.

Fig 7 Evolution of difference between imports and exports in current conditions and 10-20% and exports bigger conditions



3. Conclusions

From the depicted above it can be concluded that the extension through analogy method can be easily applied for non-linear trends and that by its application relevant trends can be established in an economical analysis which provides information useful for theorists and practitioners.

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